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Universidade Federal do Estado do Rio de Janeiro

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## REVIEW

An analysis of scientific literature about the use of central venous catheters in hospitalized adults

Análise da produção científica acerca do uso de cateter venoso central em adultos hospitalizados

Una analice de la literatura científica sobre el uso de catéteres venosos centrales en adultos hospitalizados

Karine Poerschke Leal<sup>1</sup>, Nara Marilene Oliveira Girardon-Perlini<sup>2</sup>, Laura de Azevedo Guido<sup>3</sup>

### ABSTRACT

**Objective:** to characterize the scientific production related to the use of central venous catheter for patients hospitalized adults. **Method:** A literature search with VHL, in databases BDENF, LILACS and SciELO, using the keywords: central venous catheter and an adult. 11 articles were selected for analysis. **Results:** The production on the theme is developed mainly for medical journals published in this knowledge area, approaching the incidence of infections and associated factors. Other aspects discussed relate to the indications for use of the CVC, and insertion site complications. With respect to nursing care, to prevent and minimize the amount of infections and maintain the proper functioning of the catheter, highlight hand washing as a measure paramount. **Conclusion:** The low current scientific production of nursing focusing on this issue points to the need to resume the clinical aspects of daily care for the hospitalized patient. **Descriptors:** Nursing, Central venous catheterization, Adult, Inpatients, Hospitalization.

### RESUMO

**Objetivo:** Caracterizar a produção científica relacionada ao uso de cateter venoso central por pacientes adultos hospitalizados. **Método:** Estudo bibliográfico com busca na BVS, nas bases de dados BDENF, LILACS e na SciELO, utilizando-se as palavras-chave: cateter venoso central e adulto. Foram selecionados 11 artigos para análise. **Resultados:** A produção na temática é desenvolvida principalmente por médicos, publicadas em revistas desta área do conhecimento, abordando a incidência de infecções e fatores associados. Outros aspectos abordados relacionam-se às indicações para a utilização do CVC, local de inserção e complicações. Com relação ao cuidados de enfermagem, para evitar e minimizar o quantitativo de infecções e manter o bom funcionamento do cateter, destacam a lavagem das mãos como medida primordial. **Conclusão:** A pouca produção científica atual da enfermagem focando essa temática aponta para a necessidade de retomar aspectos relativos à prática clínica do cotidiano do cuidado ao paciente hospitalizado. **Descritores:** Enfermagem, Cateterismo venoso central, Adulto, Pacientes internados, Hospitalização.

### RESUMEN

**Objetivo:** Caracterizar la producción científica relacionada con el uso de catéter venoso central para pacientes adultos hospitalizados. **Método:** Se realizó una búsqueda bibliográfica con VHL, en bases de datos BDENF, LILACS y SciELO, utilizando las palabras clave: catéter venoso central y un adulto. 11 artículos fueron seleccionados para el análisis. **Resultados:** La producción sobre el tema se desarrolla principalmente en revistas médicas publicadas en esta área del conocimiento, acercándose a la incidencia de infecciones y factores asociados. Otros aspectos discutidos se refieren a las indicaciones para el uso de la CVC, y complicaciones sitio de inserción. Con respecto al cuidado de enfermería, para evitar y minimizar la cantidad de infecciones y mantener el funcionamiento apropiado del catéter, resalte lavado de manos como una medida de suma importancia. **Conclusión:** La baja producción científica de la enfermería actual se centra en esta cuestión apunta a la necesidad de reanudar los aspectos clínicos de la atención diaria al paciente hospitalizado. **Descriptor:** Enfermería, Cateterización venosa central, Adulto, pacientes hospitalizados, Hospitalización.

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## INTRODUCTION

The central venous catheter (CVC) constitutes an important resource for the support of patients dependent on prolonged intravenous medication.<sup>1</sup> It is a device widely used, especially in intensive care units<sup>2</sup>, allows the monitoring of critically ill patients, and serve as a gateway for those who require intravenous nutritional support (Total Parenteral Nutrition - TPN).

For the selection of the appropriate CVC, several factors must be considered, since it comprises the duration of treatment and type of therapy, the evaluation of the venous system of the patient, medical history, and the current diagnosis until the patient's activity level.<sup>3</sup>

The central catheter may be of no tunneled, tunneled and reservoir. The catheter no tunneled is the most widely used and easy placement and removal and dismissal surgery. Displays short durability. It is inserted by a doctor percutaneously in the subclavian vein and is directly linked to 90% of infections from catheters. The best known model is the Arrow. Another type of catheter is tunneled not peripherally inserted central catheter (PICC), which is introduced into a peripheral vein continuing until the vena cava. It features long life and can be installed by a trained nurse and with proper certification for installation PICC.<sup>4,5</sup> The vessels most commonly used for insertion are the veins of the upper and lower, after insertion is performed an imaging (X-ray) to check whether the positioning is appropriate or not.

The catheters are tunneled subcutaneously one path before entering the venous level, which enables adhesion to the fabric, facilitates the permanence of the catheter in position and reduces the risk of infection. The introduction of this catheter occurs in a surgical and has long durability. The most popular models are the Hickman and Broviac and are mostly used by cancer patients exposed to chemotherapy.<sup>6</sup>

The catheters with subcutaneous reservoir, also called totally implantable, are installed surgically in the chest wall and are fully inserted in the body.<sup>6</sup> It features long life and its main advantages are the lowest risk of infection, the lower frequency of maintenance and manipulation, the lowest impact on body image and result in greater convenience for the user. The best known is the Implantofix. It is commonly used by patients on hemodialysis or chemotherapy.

The central venous catheterization has been recommended and used with therapy and diagnostics in different patient units, regardless of clinical specialty. Despite the relative simplicity of its execution, is a technique that can offer risks and complications due to its incorrect positioning.<sup>1</sup> Notwithstanding the benefits of its use, infectious complications are the most frequent cause of morbidity.

In this context, the hospital infection represents a challenge in the clinical practice of hospitalized patients need to prevent and control invasive procedures. Thus, the CVC is an indispensable resource for the treatment of some patients, predisposing them to develop infections of local or systemic, whose incidence depends on aspects such as the type of catheter used, the frequency of manipulation in the same and related factors Patient characteristics.<sup>2,7</sup>

The access of pathogenic microorganisms to the catheter may happen at the time of insertion through the skin colonization around the orifice, contamination and extenders connection between the infusion system and vascular access, by infusion solutions contaminated used to maintain patency of the catheter, Hematogenic another and distant infection by contaminated hands of health professionals.<sup>7</sup>

Accordingly, nursing professionals play an important role in the impact of using this device. Among the measures that maximize good outcomes in catheter use are those that relate primarily to the qualification of the shares of care, which can be enabled and encouraged through the development of permanent education in health and infection control.<sup>7</sup>

Thus, it is considered that the motivation for this study is a result of experiences in an adult inpatient unit, where it became clear spot, the need to provide nursing care to patients using central venous catheters and the important role of nurses in care. We conducted a literature review in order to characterize the scientific production related to the use of CVC for hospitalized adult patients.

## METHODOLOGY

This is a bibliographical study, conducted in January and February 2011, guided by a systematic review of the literature, which can be defined as a methodology performed to obtain consensus on any specific topic and synthesize knowledge a given area, through methodological steps.<sup>8</sup>

In conducting the study, followed the steps, according to Santos<sup>8</sup>, which determine the wording of a question, identification, selection and critical evaluation of scientific papers indexed in electronic databases.

In this sense, has established itself as the guiding question of the study: Trends of publications related to central venous catheters in hospitalized adult? To build the corpus of analysis, there was the search for scientific articles indexed in databases LILACS (Latin American and Caribbean Health Sciences) BDENF (Database of Nursing), and the Scientific Electronic Library Online (SciELO), using the keywords: central venous catheter and an adult. Inclusion criteria were defined: Articles in English, Portuguese and Spanish, without temporal boundaries and indexed in databases and electronic library mentioned above. And as exclusion criteria, work with summaries available online, abstracts of theses, dissertations, conference proceedings, inadequate to the object of study, such as studies about the use of the catheter Jobs that appeared in the same or duplicate in another database were once considered.

After selecting the abstracts, we proceeded to search the full articles and read them, organizing a summary table where each publication received a numbered according to the order in which it was located and the characterization for each work. In this sense, was identified and quantified the journal in which each work was published, the title, year of publication, language, author, and training objectives, mode of publication (research, case study, review, reporting experience, reflection), the study design when it came to research, the main results and conclusion.

Based on reading the articles, it was the organization of the publications, the convergence of content and systematized contents were in the form of categories.

## RESULTS AND DISCUSSION

As a result of the search conducted in the databases, met eighty-one jobs in total, with seventy-four contained in LILACS, seven, and none in BDENF in Scielo. Of these, five were in duplicate and were considered only once, and four were abstracts of theses, projects or conference proceedings and were automatically excluded. Seventy-two papers were selected for the study.



The seventy-two publications, sixty one had inadequate because they are the subject of pediatric patients using ambulatory or home CVC, among other factors, so the sample consists of eleven papers.

Figure 1. Characterization of articles about the authors, year, education, language, method, periodic.

Authors / year	Formation of the authors	Language	Method	Periodical
Mesiano, Merchán-Hamann, 2007 <sup>(2)</sup>	Medicine	English	Quantitative	Latin American Magazine of Nursing
Banha; Vivas; Pires, 2009 <sup>(6)</sup>	Nursing	Portuguese	Qualitative	Nursing magazine
Netto et al, 2009 <sup>(7)</sup>	Nursing	Portuguese	Quantitative	Gaúcha Magazine of Nursing
Reina et a, 2003 <sup>(9)</sup>	Medicine	Spanish	Quantitative	Intensive Care Medicine
Paz Rojas et al, 1999 <sup>(10)</sup>	Medicine	Spanish	Quantitative	Bolivia Peruvian Society of Internal Medicine
Carvalho et al, 1999 <sup>(11)</sup>	Medicine	Portuguese	Quantitative	Medicine (Ribeirao Preto)
Diener; Coutinho, 1996 <sup>(12)</sup>	Medicine Nursing	Portuguese	Quantitative	Magazine of the Medical Brazilian Association
Utyama et al, 1997 <sup>(13)</sup>	Nursing	Portuguese	Quantitative	Brazilian Magazine of Nursing
Calvo, 2008 <sup>(14)</sup>	Medicine	Spanish	Qualitative	Chilean Magazine of Intensive Medicine
Cafaro et al., 1997 <sup>(15)</sup>	Medicine	Spanish	Quantitative	Intensive Care Medicine
Feldman, Vitola, Meyer, 1984 <sup>(16)</sup>	Medicine	Portuguese	Quantitative	Brazilian Archives of Cardiology

As can be seen in the table above, in relation to the main authorship, four relied on nurses as author or co-author and, in eight authors were physicians. Nine (81.8%) it was a quantitative survey of epidemiological slant and two (18.2%) were characterized as a review. As for the language, six were in English, four in Spanish and one in English.

According to the journals where the papers were published, it was observed that three were related to nursing, ie, it became clear that there are few publications directed at this theme developed by nursing.

As for the number of publications, there is a shortage of production in nursing regarding care for the central venous catheter, even though handling this device an activity in daily work.

A survey (17) conducted in order to examine the publications of clinical nurses in national journals, notes that investigative actions and disclosure by these professionals are essential, as they allow to acquire, produce and deepen knowledge, modernize their practices and consider, conduct

troubleshooting methodologically grow professionally by encouraging reflection of new ways of doing their work and awaken to the knowledge scientifically structured. Still, points out that the low production has imposed restrictions on professional development, which results in lower visibility of the professional scientific community.

Regarding the year of publication of the work, it was observed that most publications are not current, ie five publications are the 90 and is a publication of the 80s. Becoming necessary and allowing / enabling new research, where knowledge is grounded in a contemporary and modern literature.

As regards the aspects addressed in studies revealed a related approaches to the indications for the use of a CVC, for example, conditions of hypovolemia (shock), hypotension, administration of irritating drugs, such as chemotherapy, administration of drugs over term administration of transfusions, parenteral nutrition, blood draws frequent hemodialysis and in the case of peripheral access difficult.<sup>6</sup>

As inserting a CVC, this can be done through a chest approach, or abdominal inguinal. In thoracic approach, the large veins of the upper chest (subclavian, jugular or axillary) are the most sed. In inguinal approach, we use the femoral vein, while in the abdominal approach, using the inferior vena cava(6). There is standardized in relation to conduct insertion of catheters and antiseptic to be used.<sup>2</sup>

Regarding complications, identifies himself as predominant, phlebitis, thrombosis, arrhythmia, embolism, local infection, sepsis, endocarditis, catheter displacement or migration of the catheter tip, rupture dispositive, allergy material, clots and obstruction of the lumen.<sup>6</sup> Complications included six studies<sup>2,7,9-12</sup> identified the occurrence of catheter-associated infections as the most frequent, two<sup>7,11</sup> indicate the male as the most affected and two other publications<sup>10,13</sup> show the microorganism *Staphylococcus aureus* as the most common. The puncture performed in right subclavian catheter double-lumen were associated with infection, as well as patients with neurological and tracheostomized.<sup>2</sup>

Issues related to the incorrect position the catheter; however, were not related complications.<sup>16</sup> With regard to measures for preventing complications highlights some appropriate care dispensed by nursing staff to manipulate the catheter, such as heparinization of the correct lumens and the use of aseptic technique during handling and insertion procedures.<sup>6</sup>

Nursing care are considered essential to prevent infection and to promote the proper functioning of CVC, among them, highlight the wound dressing that can be daily (when covered with gauze) or regular (when covered with transparent film and follows validity period ); proper observance of asepsis and use of appropriate solution and sterile dressing material; avoid manipulation unnecessary, conducting exchange of catheters and stents common (as is routine in each institution); observation time of catheter, presence of erythema , edema, bruising and / or secretion per orifice.<sup>7</sup>

It is evident that the present trend in articles published is directed mainly to identify the incidence of infection and complications in patients who use CVC as well as the association with various risk factors and the etiologic agent of infections.

It is clear, however, that infection associated with central catheter has not been a limitation to the adoption of their use in daily care. However, has stimulated the search for better techniques for prevention, diagnosis and treatment of infections.<sup>14</sup>

From the perspective of minimizing the amount of recurrent infections, studies<sup>2,7,15</sup> indicate that standardization of procedures related to catheter use and education of the healthcare team can be important measures for prevention of complications from misuse catheter; called attention to

handwashing as a strategy in the primary prevention of nosocomial infections. For this, coupled with awareness of the professional staff is necessary to promote conditions suitable for such procedure.<sup>2</sup>

## CONCLUSION

The Central Venous Catheter (CVC) is a device used as an important ally in making an appropriate and effective therapy to hospitalized patients, because it is a material that offers better conditions and greater variability for the continuity of the various treatments that require intravenous access.

It was found a short scientific production by nursing staff about CVC, considering that this technology represents a constant demand for care in clinical practice. Moreover, it became clear that the production related to the use of peripherally inserted central catheter (PICC) in adult patients, a procedure performed by well trained nurses is also scarce in Brazilian literature and Latin American.

It was observed that the theoretical and practical knowledge and awareness on the part of professionals, particularly nursing staff to care for the CVC is important to minimize the occurrence of infections and complications related to their use. Accordingly, standardize procedures related to such care can be a strategy in order to reduce complications and, consequently, the hospital stay and hospital costs. Moreover, this investment supports for improving and upgrading care provided by the nursing staff, resulting in improved efficiency and service.

Thus, considering the current scientific production of nursing focused to the topic, one realizes the need to invest in aspects of the clinical practice of daily care for the hospitalized patient. Accordingly, it is recommended that nursing invest in production and publication of knowledge that can extend, support, strengthen and promote the making and professional autonomy.

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